the torque is transferred to swivel the module **20** at a desired relative angle to module **10**. The same happens for each successive pair like modules **20** and **30**, etc. The encoder **9**, the body or which is fixed to the body of module **10** (or **20**, **30**, etc.) and the shaft of which is attached to shaft **8a** measures this relative angle. An electromagnetic break **6** is provided to keep this angle fixed for performing a desired pose of the robot. The body of the break **6** is fixed to the body of module **10** (or **20**, **30**, etc.) and the shaft of **6** is fastened to the shaft **8b.**

In order to achieve appropriate torques for the plurality of modules **10**, **20**, **30**, etc., and their mechanisms, the triple of wheels **3a**, **3b** and **3c** should be selected to give appropriate ratio of the bevel gear.

As the kinematical scheme and principle of operation of the second embodiment mechanism can be designed in a variety of concrete mechanical constructions, they are considered as not deviating from the spirit of the present invention and therefore embraced by it.

A third embodiment obtained by modification of the first embodiment is shown on FIG. 3, where manipulator arm or "elephant trunk" configuration of the redundant modular robot is presented. In this case the entire scheme of the first embodiment is preserved and augmented by a base module providing two additional robot degrees of freedom, installed to appropriate working space.

One axial rotating degree of freedom is obtained by a second driving motor **200**, the body of which is fastened to a body **201** articulating around the body of the proximal robot module **10**. Pair of transferring wheels **202** and **203** is used for passing the torque of motor **200** to the body of module **10**. Wheel **202** is fixed to the output shaft of the motor **200** and wheel **203** is fixed around the body of module **10**. The speed and desired angle of rotation are achieved by appropriate control of motor **200**.

Second rotating degree of freedom about a vertical axis is obtained by a third driving motor **300**, the body of which is fastened to the body of the base **301** installed to the working space. The body **201** articulates in appropriate bearing in the body **301**. The output shaft of motor **300** is fixed to body **201**, which receives the torque produced by motor **300** directly. The speed and desired angle of rotation are achieved by appropriate control of motor **300**.

Alternatively, the base **301** can be installed on a mobile platform for performing mobile robot manipulation.

As this invention may be concretized in several forms without deviating from the spirit of indispensable characteristics thereof, the present embodiments are therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims, or equivalence of such metes and bounds thereof are therefore intended to be enfolded by the claims.

CLAIMS

What is claimed is:

1. A method for driving multiple-module mechanisms by a single motor and redundant modular robots produced therefrom based on a very simplified approach employing only one irreversible motor that is driving the said mechanisms inside the multiple modules in said redundant modular robot by means of flexible shaft, which transports the torque/ rotation of said single irreversible motor to the said mechanisms inside all multiple modules of the robot,

said method further using:

a plurality of pairs of electromagnetic clutches and respective kits of transmission and driving wheels to distribute selectively the torque/rotation of the said single irreversible motor to anyone of the said robot modules as a desired destination, such that when a said electromagnetic clutch is powered-on the rotation in one direction of said flexible shaft is translated to the shaft of the destination said mechanism through a respective said transmission wheel or alternative said clutch and respective said transmission wheel are activated if the opposite direction of rotation is desired,

an electromagnetic break for keeping the desired relative angle between two adjacent said modules of said redundant modular robot,

a simple control system, the first part of which has the main task to regulate and stabilize the angular speed of said single irreversible motor, while the second part of the said control system employs simple on-off logic control of said electromagnetic clutches and said breaks based on feedback of a set of angular sensors measuring the angle between each two consecutive said robot modules.

2. A redundant modular robot comprising a plurality of modules each of which being with the same internal construction and being articulated at one end thereof to the next adjacent said module by an inter-link shaft such that the entire said robot forms a chain of multiple said modules that are driven by a flexible shaft, which penetrates all said modules, the distal side of which being extended up to the desired number of said modules in said robot, the proximal end of said flexible shaft being connected to the output shaft of a driving irreversible motor, the body of which being fixed to the proximal module of said chain of multiple modules, and an end-effector connected to the distal module of said robot.

3. A redundant modular robot as in claim 2, characterized in that same construction can have double functioning, meaning when said proximal module of said chain of mul-

tiple modules is fixed on a base installed to appropriate working space the said robot behaves as a manipulator arm or "elephant trunk", and when said proximal module of said chain of multiple modules is unfixed the said robot behaves as a "snake" or "earthworm".

4. A redundant modular robot as in claim 2, characterized in that each of said multiple modules comprises a primary driving wheel being fixed to said flexible shaft, a pair of primary transferring wheels each of which is coupled to said primary driving wheel such that the said primary transferring wheels have opposite directions of rotation to each other, a pair of electromagnetic clutches, the body of which is fixed to the body of said module and the shaft of each said electromagnetic clutch is fastened to one of said primary transferring wheels, a pair of secondary transferring wheels each of which is fixed to the moving part of the respective said electromagnetic clutch, such that when said electromagnetic clutch is powered-on, the said secondary transferring wheel receives the rotation from said primary transferring wheel, a secondary driving wheel, which is fixed to the said inter-link shaft and is also coupled to both said secondary transferring wheels such that receives the rotation from one of said secondary transferring wheels and rotates through said inter-link shaft the said next adjacent module, an encoder the body of which is fixed to the body of said module such that the angle of rotation of the said inter-link shaft is measured by said encoder, an electromagnetic break the body of which is fixed to the body of said module such that when the said break is powered on the angle of rotation between the said module and its said next adjacent module is kept unchanged for providing a desired pose of said robot.

5. A redundant modular robot as in claim 3, characterized in that when a manipulator arm or "elephant trunk" is constructed one axial rotating degree of freedom is introduced by a second motor, the body of which is fastened to a cylindrical body articulating around the body of the said proximal module such that a pair of transferring wheels the first of which being fixed to the output shaft of the said second motor and the second of said transferring wheels is fixed around the body of said proximal module.

6. A redundant modular robot as in claim 5, characterized in that a second degree of freedom swiveling around an axis that is perpendicular to the axis of said axial rotating degree of freedom by means of a third motor, the body of which is fastened to a base and the output shaft of said third motor is fixed to said cylindrical body, which articulates in appropriate bearing in the said base that is can be installed at appropriate working space or on a mobile platform for performing mobile robot manipulations.